 **UNIVERSITY OF MAINE AT FARMINGTON**

**COLLEGE OF EDUCATION, HEALTH AND REHABILITATION**

**LESSON PLAN FORMAT**

**Teacher’s Name:**Frank Makuch **Lesson #:** 2 **Facet:** Interpret  
**Grade Level: 10** **Numbers of Days: 2**  
**Topic: Geometry**  
  
**PART I:**  
  
**Objectives**  
  
Students understand that geometric design can be important for aesthetic and other reasons.  
Students will know how to calculate and use the golden ratio in design.  
Students will be able to recognize the importance of geometry in design.  
  
**Product:**  
Glogster Poster  
  
**Maine Learning Results (MLR) or Common Core State Standards (CCSS) Alignment**  
**Content Area:** Mathematics  
**Grade Level:** High school  
**Domain:** *Modeling with Geometry*  
**Cluster:** *Apply Geometric Concepts in Modeling Situations*  
**Standard:** *Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*  
  
**Rationale:**  
Students will be able to recognize the importance of the golden ratio and how the ratio can inform design projects.  
  
**Assessments**  
**Formative (Assessment for Learning)**  
**Section I – checking for understanding during instruction**  
Students will pair up and measure the heights of each persons head and navel. The two heights and resulting ratio will be compiled in a class list.  
  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will be able to see the correlation of their information with the rest of the class when they compare the ratio. Also, in the worksheet portion of the lesson the students will see that their ratios were similar to the golden ratio.  
  
**Summative (Assessment of Learning):**  
Students will be asked to design a a Glogster Poster. This poster will be viewed online and must demonstrate an understanding of the golden ratio and how it relates to the real world. Research is expected to be done in order to find real life unique examples of the golden ratio in action. Students who can make the design of their poster follow golden ratio design principles will receive extra credit.  
  
**Integration**  
**Technology:**  
Glogster Poster  
  
**Content Areas:**  
Art: Students will recognize the link between art and math  
English: Collaboration with others  
  
**Groupings**  
**Section I - Graphic Organizer & Cooperative Learning used during instruction**  
Students will be given partners so that they can measure each other. They will be given an organizer for them to fill in so that they can record their heights and ratios.  
  
**Section II – Groups and Roles for Product**  
The Glogster poster will be created individually.  
  
**Differentiated Instruction**  
  
**MI Strategies**  
  
**Verbal: S**tudents may use text in the Glogster poster itself.  
**Logic:** Students must calculate golden ratio.  
**Visual:** Students will design a Glogster poster.  
**Kinesthetic:**Students will be measuring body parts to find the golden ratio.  
**Musical:** Students will be able to upload audio to the Glogster poster.  
**Interpersonal:** Students are organized into teams of two.  
**Naturalist:** The golden ratio is natural and pleasing to nature  
  
  
**Modifications/Accommodations**  
***From IEP’s ( Individual Education Plan), 504’s, ELLIDEP (English Language Learning Instructional Delivery Education Plan)****I will review student’s IEP, 504 or ELLIDEP and make appropriate modifications and accommodations.*  
  
**Plan for accommodating absent students:**  
Students absent the first day will have to meet with the teacher to receive the product assignment on the second day, the student will then be responsible for the product to be turned in on the due date. Students absent just the second day will not be in a bad situation as the entire second day will be used to create the poster. The absent student will receive a couple days extension. Students absent both days will have to meet with the instructor and will receive a full weeks extension.  
  
**Extensions**  
Students will be asked to turn in the Glogster poster to be graded a week after the second class period.  
  
**Type II technology:**  
Glogster Poster  
  
**Gifted Students:**  
Students will be able to draw connections with the golden ratio to anything. Gifted students will be encouraged to find abstract connections.  
  
**Materials, Resources and Technology**  
*Meter sticks*  
*Post it notes*  
*calculator*

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*Computers to make Glogster poster*  
  
**Source for Lesson Plan and Research**  
<http://www.saintjoe.edu/~tsp/lessonplan.html>  
*Used to find lesson plan handouts, and to help figure out the entire lesson.*  
<http://www.goldennumber.net/golden-section/>  
*This source will be given to the students to start them off on their research, it is a great resource with many good research ideas.*  
  
**PART II:**  
  
**Teaching and Learning Sequence (Describe the teaching and learning process using all of the information from part I of the lesson plan)***Take all the components and synthesize into a script of what you are doing as the teacher and what the learners are doing throughout the lesson. Need to use all the WHERETO’s. (3-5 pages)*  
  
**Day 1**  
**10 mins -** The hook, The teacher comes prepared with a projection presentation. The presentation analyzes the faces of a couple different celebrities based on the golden ratio and ranks them in accordance with how closely they correspond.  
**30 mins -** Students are broken down into groups of two, in which one student measures the other student and heights are recorded from the top of the head and navel. When groups have finished the class will be brought together to compile the data as a class and find an average ratio.  
**30 mins -** Most of the teaching is done at this time, the class will go over the rest of the handout together, discovering Fibonacci numbers and other related items.  
**Remainder of class period -** The product will be described and expectations for the product will be given. An example of a completed product will be shown.  
  
**Day 2**  
**Entire Class period -** Students will use this time to work on their Glogster poster.  
  
**Class arrangements**  
On the first day students will be organized as pairs around the room to complete the measuring portion. When not in measuring groups, students will be in a traditional classroom setting with rows. On the second day students will all be working individually on computers, so students will arrange in rows.  
  
Students will know and understand how the Golden ratio can be used to make designs more appealing. They will understand the natural way in which the golden ratio is present, and how we see it everyday but fail to recognize it. The importance of the hook can be seen in this explanation as students begin to realize that mathematical concepts are all around them. This will (hopefully) inspire in them some amount of curiosity in the applications of the golden ratio and Fibonacci numbers.  
**Where, Why, What, Hook Tailors:** Logic, Visual  
  
Students will know how to measure and how to find ratios between two measurements. Students will measure each others heights from different points in pairs so as to collaborate and find the ratio organically using every day items (the human body). Students will record their heights and ratios in a class list so that the entire class can find the average ratio. This process will also emphasize the scientific process in the minds of the students. After this process is complete the class will analyze this data together to see how it applies in other situations. They will see how it relates to the Fibanocci sequence. Students will use these understandings in their product, which is a Glogster poster.  
**Equip, Explore, Rethink, Tailors:** Verbal, Logic, Visual, Kinesthetic, Interpersonal, Intrapersonal  
  
Students will explore the ways in which the golden ratio can be applied by doing internet research on the subject. The research should be incorporated into the product poster. Students will need to fill out a research chart so that they are known to be organized during the research portion. The chart will not be collected or graded.   
  
**Explore, Experience, Rethink, Revise, Refine, Tailors:** Intrapersonal, Naturalist, Musical, Verbal, Logical, Visual.  
  
  
**Content Notes**  
Students will know…..   
The golden ratio a/b = (a+b)/a or 1.618  
The Fibonacci sequence and how it reacts - 0, 1, 1, 2, 3, 5. 8, 13, 21...  
How to measure and find ratios  
  
  
**Handouts**

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**Maine Common Core Teaching Standards for Initial Teacher Certification and Rationale**  
  
***Standard 1 – Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.***  
  
  
***Learning Styles***  
  
***Clipboard:*** These learners will be our fact checkers. They need to know that this theory holds up to practical scrutiny. These students will be happy to document the ways in which the golden ratio can be found. They will also be able to see the practical applications.  
  
  
***Microscope:*** The scientific process by which this lesson operates is conducive to the microscope learner. The student will be able to see for themselves where the data are coming from.  
  
  
***Puppy:*** Puppy learners will find comfort in creating the product. These learners should like researching different thing related to the golden ratio to create the poster.  
  
  
***Beach Ball:*** These learners should be happy to explore new topics and do some research to find new ways to apply the golden ratio. This learner should enjoy the process of creating a poster with different elements.  
  
  
  
***Rationale:***The lesson will provide a new framework from which to view design. Beauty may become objectified in a way that students may not have been aware of. The scientific process of finding beauty may be counter intuitive to some. This will broaden the students understanding of how and where the scientific process can be used. It will also instill critical thinking and logic to be applied in every day situations.  
  
  
***Standard 6 -* *Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their on growth, to monitor learner progress, and to guide the teacher's and learner's decision making.***  
  
***Formative:***  
Students will be asked complete a worksheet with the class during the lesson. Students will have to turn in the worksheet for a grade at the end of the class period.  
  
***Summative:***  
Students will create a Glogster poster which will be a culmination of what the students have researched about the golden ratio and the Fibonacci sequence.  
  
***Rationale:***  
Students will find out through research how the world around us has an order. They will come to see that order in everyday things.  
  
***Standard 7* - *Planning Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.***  
  
***Content Knowledge:***  
  
***MLR or CCSS:*** CCSS  
  
***Facet:*** Interpret  
  
***Rationale:*** Students will be able to interpret the world around them in a way that they have not seen before. The lesson gives them the skills to see beyond the subjective and reach part of the objective base for understanding.  
  
***Standard 8 -* *Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.***  
  
***MI Strategies:***  
**Verbal: S**tudents may use text in the Glogster poster itself.  
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**Visual:** Students will design a Glogster poster.  
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**Interpersonal:** Students are organized into teams of two.  
**Naturalist:** The golden ratio is natural and pleasing to nature  
  
***Type II Technology:***  
Glogster poster with embed text, music, and images to show their understanding and research of the golden ratio and the Fibonacci sequence.  
  
***Rationale:***  
Glogster allows students to show their understanding in an open way so that many different elements can be incorporated.  
  
***NETS STANDARDS FOR TEACHERS***  
**1. Facilitates and Inspire Student Learning and Creativity. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.**  
a. Promote, support, and model creative and innovative thinking and inventiveness  
  
b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources  
  
c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes  
  
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments  
  
***Rationale:***  
Collaboration is used in the lesson. real world connections are made by the researching students and through the hook and other activities.  
  
**2. Design and Develop Digital Age Learning Experiences and Assessments. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop knowledge, skills, and attitudes identified in the NETS-S.**  
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity  
  
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress  
  
c. Customize and personalize learning activities to address students’ diverse learning styles, working strategies, and abilities using digital tools and resources  
  
d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching  
  
***Rationale:***